(12) UK Patent Application (19) GB (11) 2 139 011 A

(43) Application published 31 Oct 1984

(21) Application No 8310424

(22) Date of filing 18 Apr 1983

(51) INT CL³
H02K 16/02

(52) Domestic classification
H2A TJ

(56) Documents cited
GB 0948013

(58) Field of search
H2A

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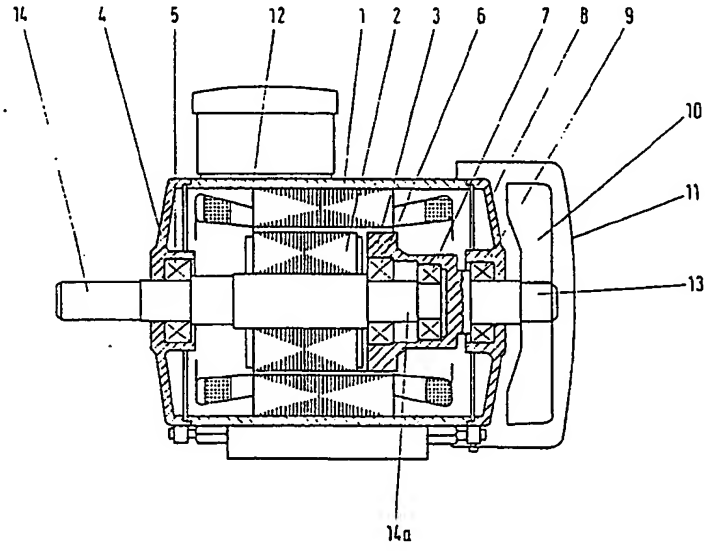
(54) Asynchronous motor with two rotors

(57) An asynchronous electric motor comprises a housing 12, a stator 1 arranged in the housing 12, first and second end plates 4,8 arranged in the housing to mount the rotor, a two-part rotor 2, 3 arranged in the housing to co-operate with the stator 1 and a ventilating fan 10 arranged to be driven by the rotor 2, 3 in order to cause cooling air to pass through the housing 12.

The first part 2 of the rotor comprises a short-circuited laminated rotor part which is coupled with an output shaft 14 in order to form the driving part of the rotor, the output shaft being mounted in the first end plate 4. The second part 3 of the rotor comprises a body of ferromagnetic material which is coupled with a fan shaft 13 in order to drive the ventilating fan 10, the fan shaft being mounted in the second end plate 8. The first and second rotor parts 2, 3 are coupled together so that (a) they support each other in order to complete the rotatable mounting in the housing 12 of each of the rotor parts 2, 3 and (b) they permit independent rotation of each rotor part.



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The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

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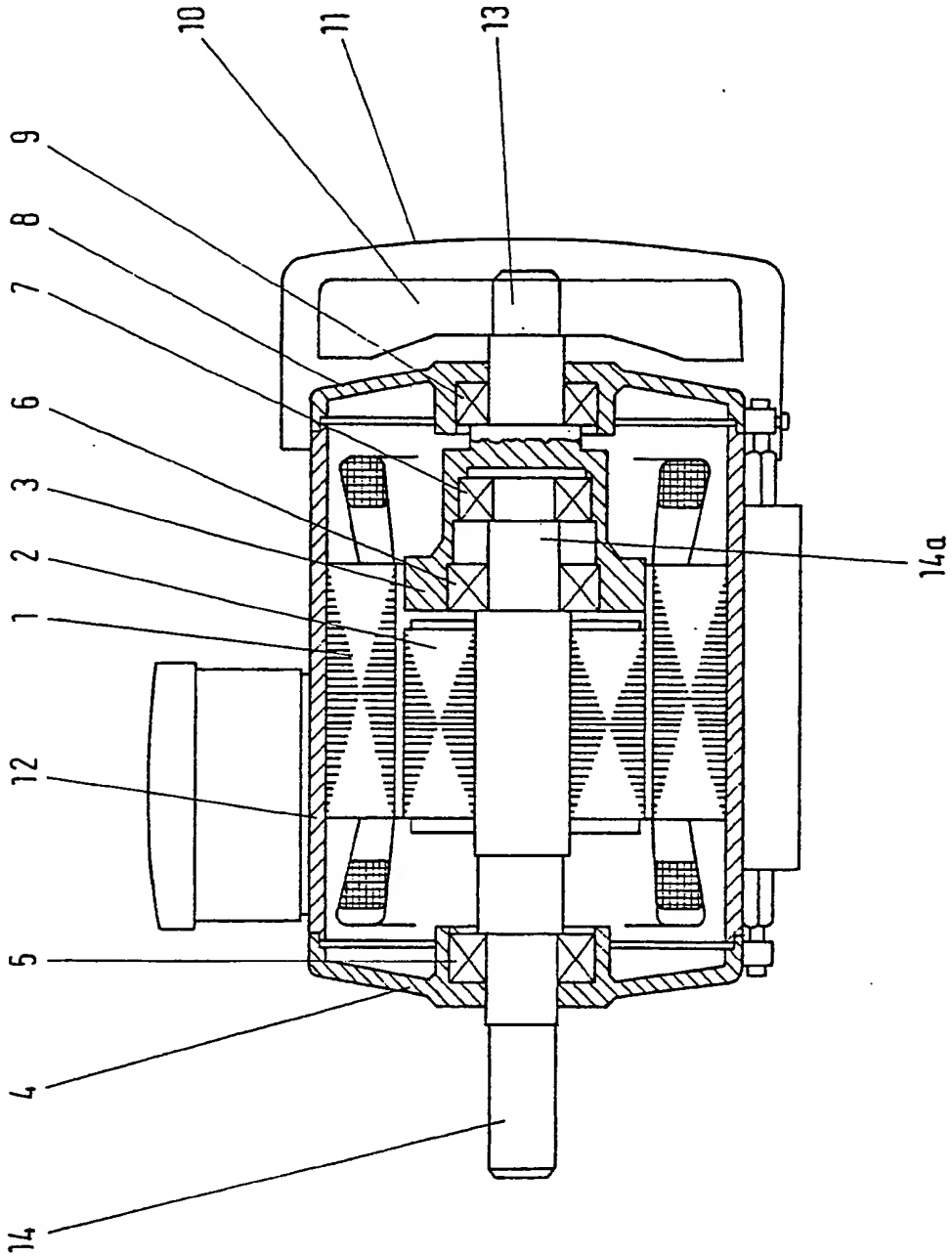

SPECIFICATION

An asynchronous electric motor having a controllable speed of rotation

This invention relates to an asynchronous electric motor having a controllable speed of rotation.

It is known to provide an asynchronous electric motor with a controllable speed of rotation over a wide range. The electric motor has three rotors arranged within the stator, namely a main laminated short-circuited rotor, a hollow non-magnetic rotor rigidly fixed to a shaft of the main rotor, and a laminated short-circuited rotor having an independent bearing support and intended to drive a ventilating fan mounted on an output shaft of the ventilating rotor. The ventilating rotor is arranged inside the hollow rotor. The shaft of the ventilating rotor is hollow, and the shaft of the main rotor easily passes through it. Fixing of the main rotor is carried out by means of a bearing in a front bearing plate and an outer bearing situated in a cover of the ventilating fan. The fixing of the ventilating rotor is provided by a bearing arranged in a back bearing plate and by an inner bearing placed in the cover of the ventilating fan, the cover being fixed to the body of the stator. The ventilating fan of the electric motor is mounted behind the back bearing plate and is covered by the cover attached to the body of the stator.

The disadvantage of the known electric motor construction described above lies in its complicated structure, and the increased air space required between the ventilating rotor and the stator, causing an increased consumption of active materials and energy.

The present invention has been developed primarily, though not exclusively, with a view to provide an asynchronous electric motor with a controllable speed of rotation, having a simplified construction and a lower consumption of active materials and energy.

According to the invention there is provided an asynchronous electric motor having a controllable speed of rotation and comprising:

a housing;

a stator arranged in the housing;

first and second end plates arranged in the housing to mount a rotor;

a two-part rotor arranged in the housing to co-operate with the stator and comprising first and second parts mounted rotatably in the first and second end plates respectively;

and a ventilating fan arranged to be driven by the rotor in order to cause cooling air to pass through the housing; in which:

the first part of the rotor comprises a short-circuited laminated rotor part which is coupled with an output shaft in order to form the driving part of the rotor, the output shaft being mounted in the first end plate in order to provide support for an end of the first rotor part which faces the first end plate;

the second part of the rotor comprises a body of ferromagnetic material which is coupled with a fan shaft in order to drive the ventilating fan, the fan shaft being mounted in the second end plate in order to provide support for an end of the second part of the rotor which faces the second end plate;

and the facing ends of the first and second rotor parts are relatively rotatively coupled together in such a way that (a) they provide mutual support for each other in order to complete the rotatable mounting in the housing of each of the rotor parts and (b) they permit independent rotation of each rotor part.

An embodiment of electric motor according to the invention may be constructed having the advantages of (a) simplified construction, (b) easier mounting in position of the two parts of the rotor in the end plates of the housing, and (c) smaller consumption of active materials and energy.

One embodiment of the invention will now be described in more detail, by way of example only, with reference to the accompanying diagrammatic cross-sectional illustration.

Referring to the drawing, there is dislosed an asynchronous electric motor having a controllable speed of rotation and comprising a housing 12, a stator 1 arranged in the housing 12, a first end plate 4 and a second end plate 8 arranged at opposite ends of the housing 12 in order to mount a rotor of the motor.

The rotor is in two part form and is arrange in the housing 12 to co-operate with the stator 1, the rotor comprising a first rotor part 2 and a second rotor part 3 mounted rotatively in the first end plate 4 and the second end plate 8 respectively. The first rotor part 2 comprises a short circuited laminated rotor part which is coupled with an output shaft 14 in order to form the driving part of the rotor having increased rotor resistance. The output shaft 14 is mounted in the first end plate 4 by means of a bearing 5 in order to provide support for an end of the first rotor part 2 which faces the first end plate 4. The second rotor part 3 comprises a body of solid ferromagnetic material which is coupled with a fan shaft 13 in order to drive a ventilating fan 10, the fan shaft 13 being mounted in the second end plate 8 by means of a bearing 9 in order to provide support for an end of the second part 3 of the rotor which faces the second end plate 8.

The facing ends of the first and second rotor parts 2, 3 are relatively rotatively coupled together in such a way that (a) they provide mutual support for each other in order to complete the rotatable mounting in the housing 12 of each of the rotor parts (in addition to the mounting provided by the arrangement of output shaft 14 in end plate 4 and fan shaft 13 in end plate 8) and (b) they permit independent rotation of each rotor part.

Thus, the facing end of the first rotor part 2 includes a projecting stub shaft 14a which is mounted in a pair of axially spaced bearings 6 and 7 provided in the second rotor part 3. The bearings 6 and 7 are provided by means of two protective discs.

A cover for the fan 10 comprises a shell 11 which is fixed to the body or housing 12 of the stator 1.

During operation of the asynchronous electric motor disclosed herein, magnetic flux created by the stator 1 passes through the first driving rotor part 2

and the second ventilating rotor part 3. In view of the manner by which the facing ends of the first and second rotor parts 2, 3 are relatively rotatively coupled together, it is possible for the two rotor parts to rotate at different speeds. This may occur when the value of the electrical power supplied to the motor is altered in such a way as to maintain the load applied to, or required from the driving rotor part 2. The speed of rotation of the driving rotor part 2, at constant loading, will change within the whole range of control, determined by a change in the power supply, whereas the speed of rotation of the ventilating rotor part 3 will only change within a comparatively small range of speed. Accordingly, the ventilating rotor part 3 is able to drive the ventilating fan 10 at a speed which does not vary by very much, despite fluctuating operating conditions for the driving rotor part, whereby a satisfactory flow of cooling air can be delivered through the housing 12 in order to cool the parts of the electric motor.

The speed of rotation of the driving rotor part 2 may be changed also by change in the loading applied to the electric motor. The function of the ventilating rotor part 3 will still remain the same in such a case. Further, the satisfactory functioning of the ventilating rotor part 3 (and the fan 10 driven thereby) will take place throughout the entire range of control of the speed of rotation of the electric motor, the lowest limit of which range may be close to zero.

CLAIMS

1. An asynchronous electric motor having a controllable speed of rotation and comprising:-

a housing;

a stator arranged in the housing;

first and second end plates arranged in the housing to mount a rotor;

a two-part rotor arranged in the housing to co-operate with the stator and comprising first and second parts mounted rotatably in the first and second end plates respectively;

and a ventilating fan arranged to be driven by the rotor in order to cause cooling air to pass through the housing; in which:

the first part of the rotor comprises a short-circuited laminated rotor part which is coupled with an output shaft in order to form the driving part of the rotor, the output shaft being mounted in the first end plate in order to provide support for an end of the first rotor part which faces the first end plate;

the second part of the rotor comprises a body of ferromagnetic material which is coupled with a fan shaft in order to drive the ventilating fan, the fan shaft being mounted in the second end plate in order to provide support for an end of the second part of the rotor which faces the second end plate;

and the facing ends of the first and second rotor parts are relatively rotatively coupled together in such a way that (a) they provide mutual support for each other in order to complete the rotatable mounting in the housing of each of the rotor parts and (b) they permit independent rotation of each rotor part.

2. An electric motor according to claim 1, in which the facing end of the first rotor part is rotatably mounted in the facing end of the second rotor part.

3. An electric motor according to claim 2, in which a stub shaft projects from the facing end of the first rotor part and is mounted in a pair of axially spaced bearings provided in the second rotor part.

4. An electric motor according to any one of the preceding claims, including a cover surrounding the ventilating fan and fixed to the housing.

5. An electric motor according to claim 1 and substantially as hereinbefore described with reference to, and as shown in the accompanying drawing.

Printed in the UK for HMSO, D8818935, 9/84, 7102.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.